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Annunziata

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(54) **SYSTEM AND METHOD FOR VIDEO CHOREOGRAPHY**

2300/6661 (2013.01); A63F 2300/6692 (2013.01); A63F 2300/8076 (2013.01); G10H 2210/026 (2013.01);

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(58) **Field of Classification Search**

USPC 345/473, 474, 475
See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

5,793,376 A 8/1998 Tanaka et al.
5,915,972 A * 6/1999 Tada 434/307 A

(Continued)

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FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **13/778,084**

EP 0 427 043 A1 2/1992
EP 0 926 655 A1 6/1999

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(Continued)

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OTHER PUBLICATIONS

Thalmann: "Interactive Computer Animation-Human Facial Animation", 1996, pp. 182-186.*

(Continued)

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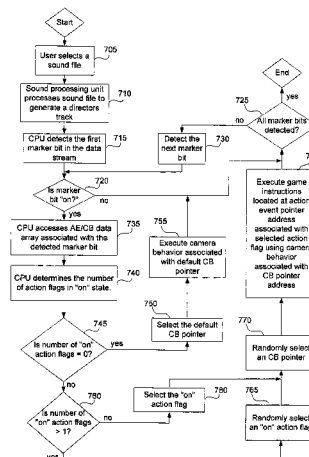
(57) **ABSTRACT**

An electronic entertainment system for creating a video sequence by executing video game camera behavior based upon a video game sound file includes a memory configured to store an action event/camera behavior (AE/CB) database, game software such as an action generator module, and one or more sound files. In addition, the system includes a sound processing unit coupled to the memory for processing a selected sound file, and a processor coupled to the memory and the sound processing unit. The processor randomly selects an AE pointer and a CB pointer from the AE/CB database. Upon selection of the CB pointer and the AE pointer, the action generator executes camera behavior corresponding to the selected CB pointer to view an action event corresponding to the selected AE pointer.

20 Claims, 7 Drawing Sheets

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FOREIGN PATENT DOCUMENTS

EP 0 945 849 A1 9/1999

EP 1 031 945 A2 8/2000

JP 2000-311251 7/2000

WO WO 98/53443 11/1998

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OTHER PUBLICATIONS

“Freely Specifiable geometry and sound control”. Prittwitz, Mar. 28, 2002 (English Translation).*

Prittwitz, Mar. 28, 2002 (English Translation), “Freely Specifiable geometry and sound control”.*

Glorianna Davenport, Thomas Aguirre Smith, Natalia Pincever, “Cinematic Primitives for Multimedia,” Aug. 1991, IEEE Computer Graphics and Applications, vol. 11, No. 4, pp. 67-74.

M. Nilsson, “103 Tag Version 2.3.0.” 103v2: The Audience is Informed, Feb. 3, 1999. Available at: <http://www.id3.org/id3v2.3.0.txt>.

Docket No. SCEA-01021, U.S. Appl. No. 10/280,640 Office Action mailed Jul. 2, 2007.

Docket No. SCEA-01021COA, U.S. Appl. No. 12/074,456 Office Action mailed Oct. 14, 2009.

Docket No. SCEA-01021COB, U.S. Appl. No. 12/841,919 Office Action mailed Sep. 29, 2011.

Docket No. SCEA-01021COB, U.S. Appl. No. 12/841,919 Final Office Action mailed Jan. 26, 2011.

Docket No. SCEA-01021COB, U.S. Appl. No. 12/841,919 Office Action mailed Oct. 4, 2010.

Docket No. SCEA-01021COC, U.S. Appl. No. 13/478,093 Office Action mailed Sep. 13, 2012.

(56)

References Cited

U.S. PATENT DOCUMENTS

5,933,150	A *	8/1999	Ngo et al.	345/473
5,982,390	A *	11/1999	Stoneking et al.	345/474
6,010,403	A	1/2000	Adam et al.	
6,040,842	A *	3/2000	Wavish et al.	345/473
6,058,397	A *	5/2000	Barrus et al.	1/1
6,331,851	B1 *	12/2001	Suzuki et al.	345/419
6,572,475	B1	6/2003	Okabe et al.	
6,650,329	B1 *	11/2003	Koike	345/473
7,162,314	B2	1/2007	Fay et al.	
7,199,301	B2 *	4/2007	Prittwitz	84/615
7,339,589	B2 *	3/2008	Annunziata	345/473
7,436,887	B2	10/2008	Yeredor et al.	
7,728,870	B2	6/2010	Rudnik et al.	
7,777,746	B2	8/2010	Annunziata	
8,184,122	B2	5/2012	Annunziata	
8,384,721	B2	2/2013	Annunziata	
2007/0005795	A1	1/2007	Gonzalez	

* cited by examiner

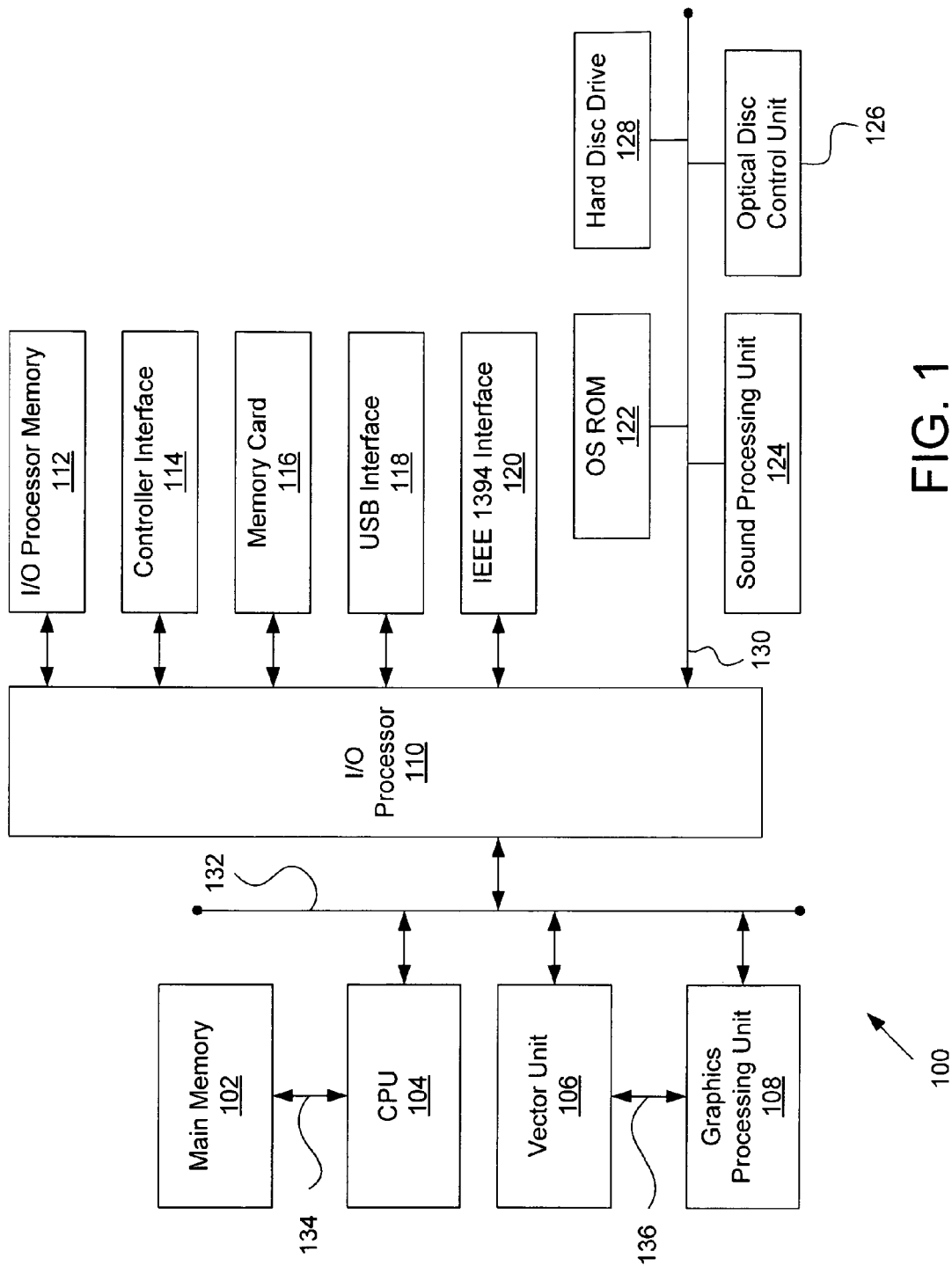


FIG. 1

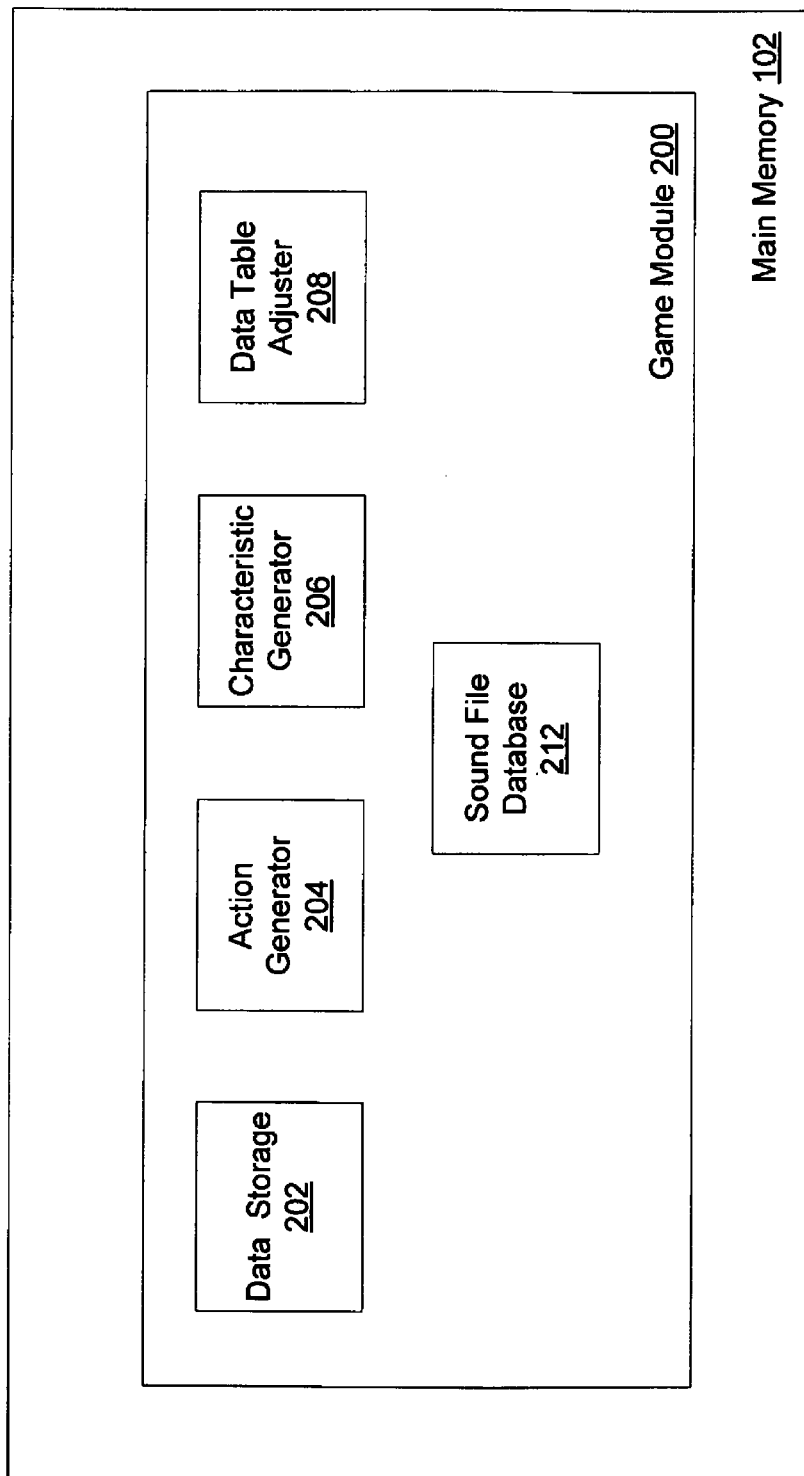


FIG. 2

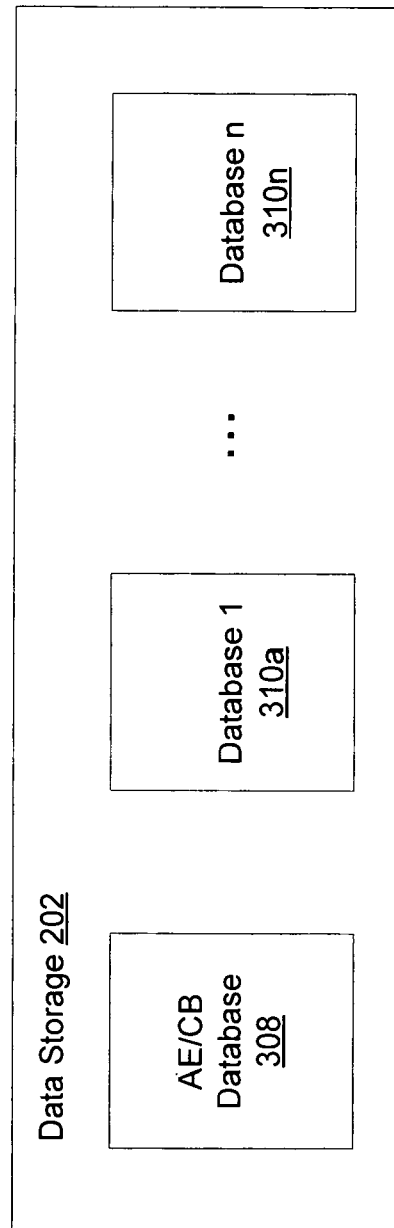
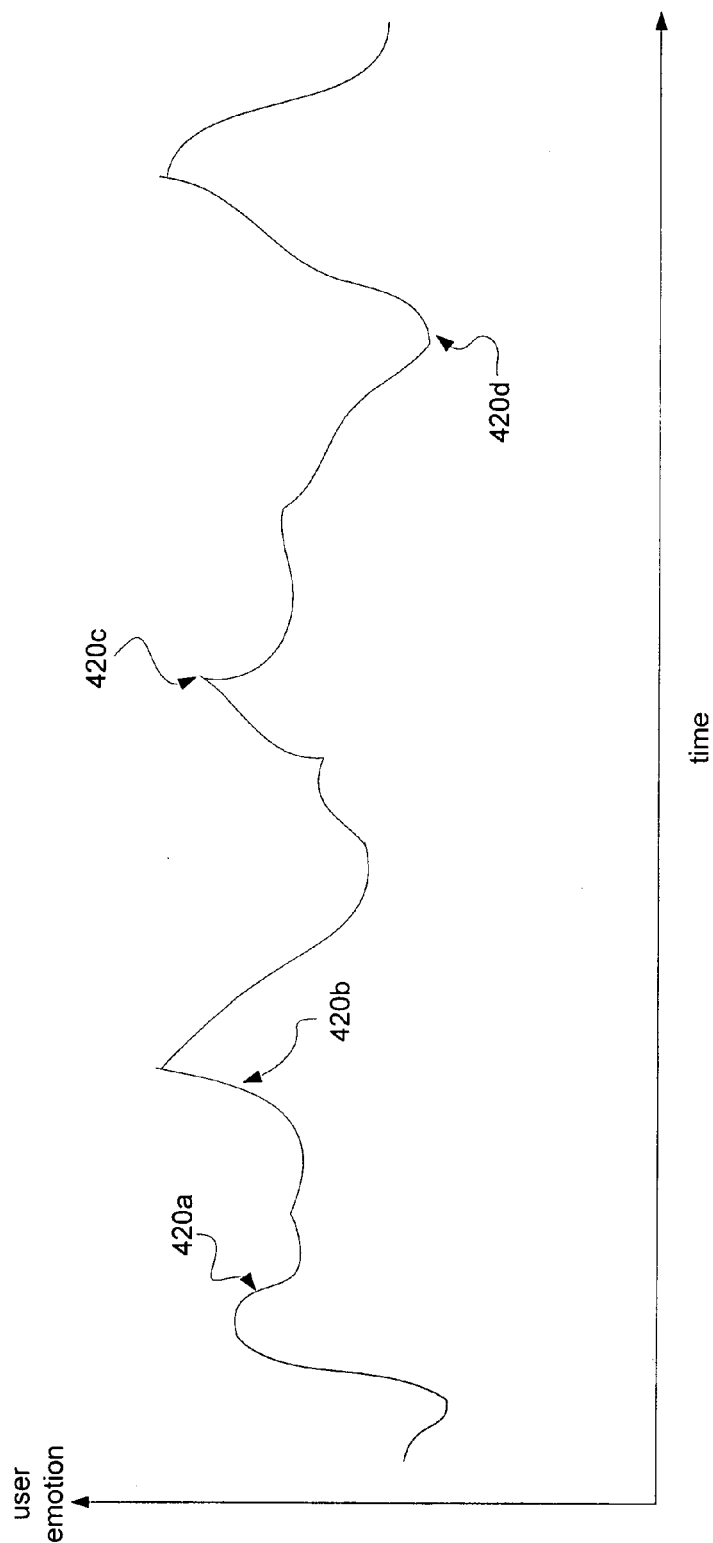
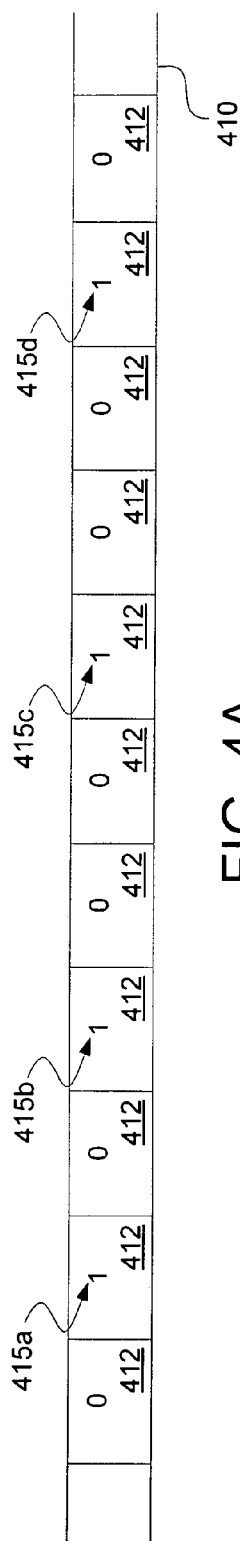


FIG. 3



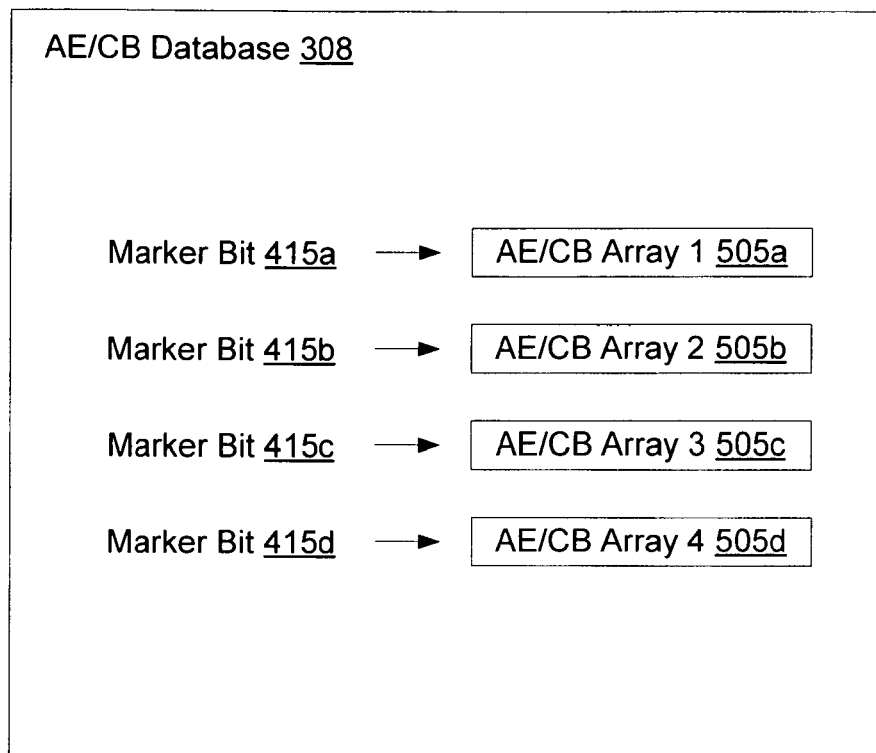


FIG. 5

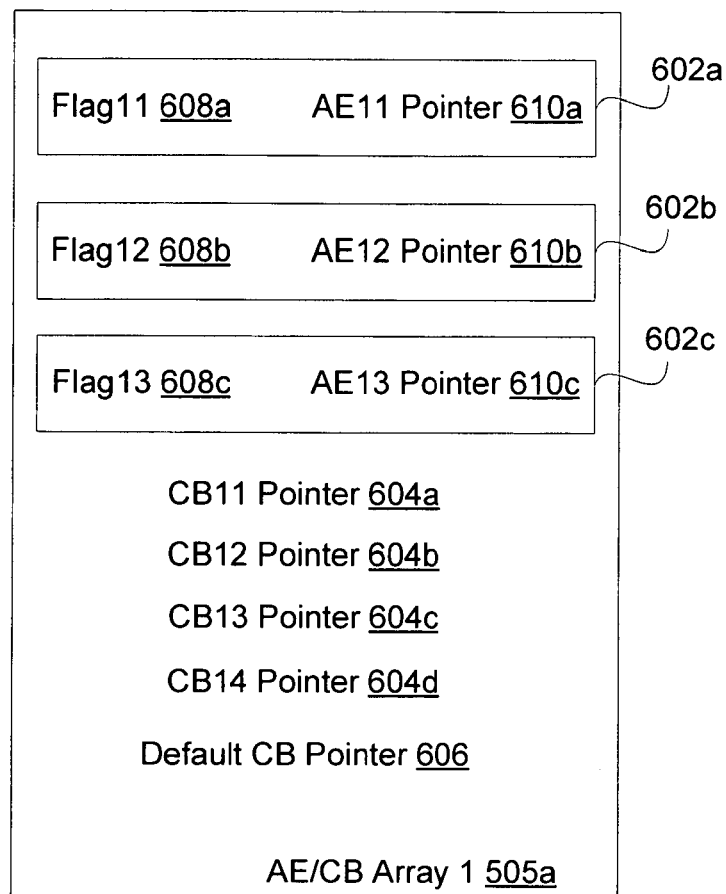
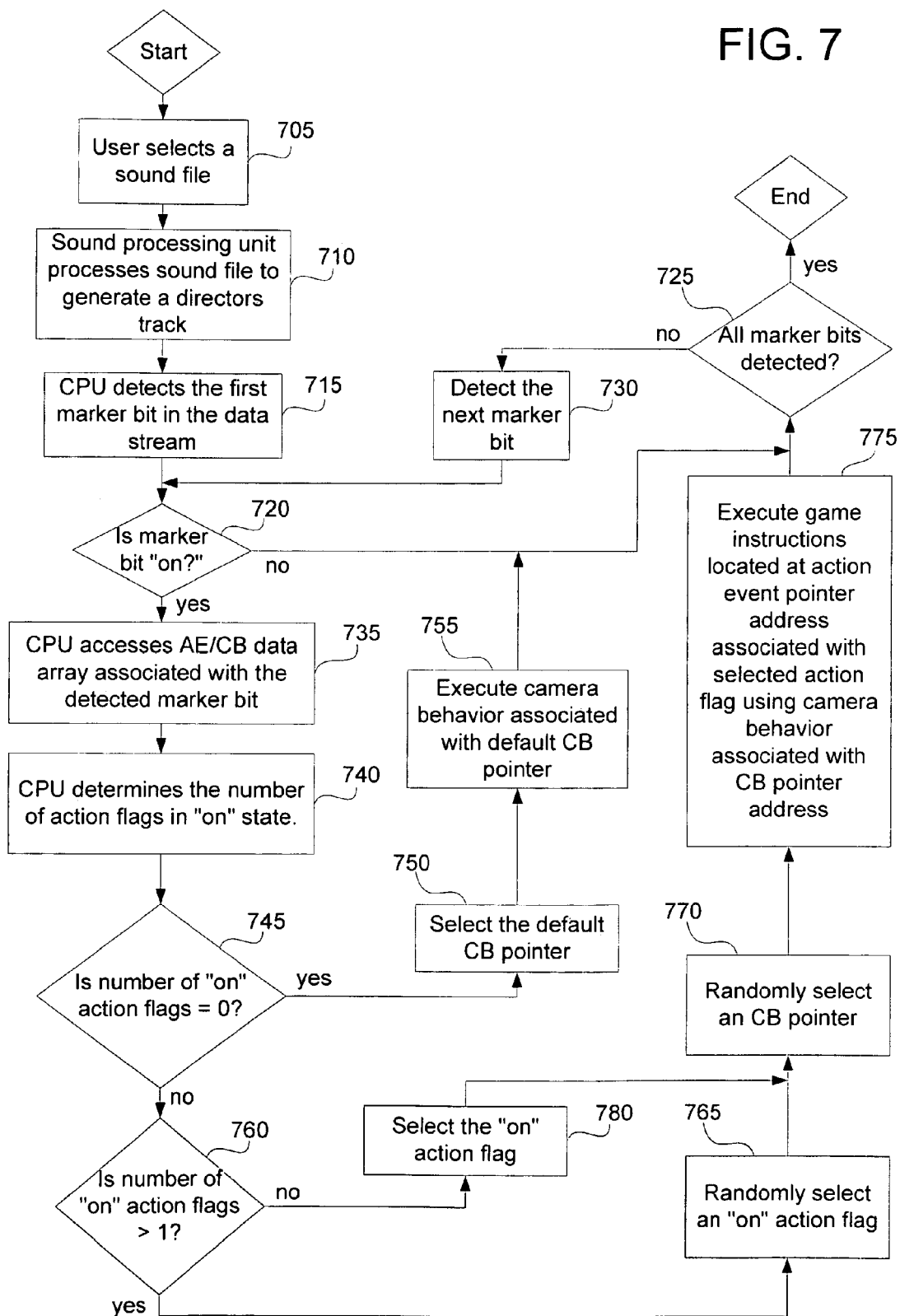


FIG. 6

FIG. 7



SYSTEM AND METHOD FOR VIDEO CHOREOGRAPHY

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation and claims the priority benefit of U.S. patent application Ser. No. 13/478,093 filed May 22, 2012, now U.S. Pat. No. 8,384,721, which is a continuation and claims the priority benefit of U.S. patent application Ser. No. 12/841,919 filed Jul. 22, 2010, now U.S. Pat. No. 8,184,122, which is a continuation and claims the priority benefit of U.S. patent application Ser. No. 12/074,456 filed Mar. 3, 2008, now U.S. Pat. No. 7,777,746, which is a continuation and claims the priority benefit of U.S. patent application Ser. No. 10/280,640 filed Oct. 24, 2002, now U.S. Pat. No. 7,339,589. The disclosure of each of the aforementioned applications is incorporated by reference.

This invention relates generally to electronic entertainment systems and more particularly to a system and method for video choreography.

In electronic systems, particularly entertainment and gaming systems, a user typically controls the behavior or actions of at least one character in a game program using some type of manually activated controller device. Conventional controller devices include joysticks, switches, buttons, and keyboards. Further, some gaming systems use specifically designed control devices, such as a steering wheel and pedals for driving simulations or a stick and pedals for flight simulations. Yet more advanced gaming systems may use voice controls or human movements in a virtual reality game. The controller devices, voice controls, and human movements may be used to directly or indirectly control character behavior and game action. For example, a game user may initially use voice commands to train a character or a group of characters to uniquely respond to future game situations without further user input.

Game designers typically tie together a video game's music with simultaneously occurring game action events and/or character behavior. For example, it is standard practice in the design of video games to either use the video action to drive the music, or to use the music to drive the video action. If a character is in a perilous situation, such as teetering on the edge of a precipice or suddenly confronting a hated enemy warrior, for example, the video action may drive the selection of sinister sounding music to reflect a mood associated with the current video action. Or, for example, if a character discovers a cache of weapons or other useful tools, this action of the character's discovery drives the gaming software to play cheerful sounding music.

In addition, a video game's music may drive the video game's action events. For example, a user may, upon game initialization, view preprogrammed user independent video game action segments driven by accompanying music. Generally, when music drives a video game's action events, a user has no control over the video game's characters or outcome, but instead is viewing an instructional segment of the video game designed, for example, to illustrate methods of game play to new users.

Typically, the traditional functional dependence between a game's music and video action limits game spontaneity and introduces a type of rigid, repetitiveness into game play. In a sense, a user's game experience is constrained by the standard relationships between music and video action. For example, when a character crosses a rickety bridge in a traditional game with direct character control, the game software plays the

same music passage for each occurrence of the same event (e.g., the crossing of the bridge).

Therefore, there is a need for a system and method for a non-standard functional dependence between a gaming environment's music and video.

SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention, an electronic entertainment system is disclosed for choreographing a video game based upon a video game sound file. The system comprises a memory configured to store an action event/camera behavior (AE/CB) database, game software such as an action generator module, and a sound file database. In addition, the system includes a sound processing unit coupled to the memory for processing a sound file selected from the sound file database, and a processor coupled to the memory and the sound processing unit. In one embodiment of the invention, the sound file is a directors track. In another embodiment of the invention, the sound processing unit processes the sound file to generate a directors track.

In one embodiment of the invention, the directors track includes preprogrammed marker bits that are either in a "1" state or a "0" state. Each "1" state marker bit marks an emotionally critical musical event in the directors track and is associated with an AE/CB array stored in the AE/CB database. The processor is configured to process the directors track to detect "1" state marker bits and to access the AE/CB arrays corresponding to the detected marker bits. The AE/CB arrays include camera behavior (CB) pointers and action flag/AE pointer pairs. Each action flag/AE pointer pair is defined to be active or inactive, dependent upon each action flag's state.

In one embodiment of the invention, the processor randomly selects one AE pointer from the active action flag/AE pointer pairs and determines an action location (AL) in a game world. Furthermore, the processor randomly selects one CB pointer from the CB pointers. Upon selection of the CB pointer and the AE pointer, the action generator executes game software corresponding to an action event associated with the randomly selected AE pointer and located at the game world AL. In addition, the action generator executes camera behavior software located by the selected CB pointer to view the action event.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of an exemplary electronic entertainment system, according to the present invention;

FIG. 2 is a block diagram of an exemplary embodiment of a main memory of FIG. 1 according to the present invention;

FIG. 3 is a block diagram of an exemplary embodiment of data storage of FIG. 2 according to the present invention;

FIG. 4A illustrates an exemplary embodiment of a directors track according to the present invention;

FIG. 4B is a graph of an emotional feeling of "fear" in a user, associated with the directors track of FIG. 4A, according to the present invention;

FIG. 5 is a block diagram of an exemplary embodiment of an AE/CB database of FIG. 3 according to the present invention;

FIG. 6 is a block diagram of an exemplary embodiment of an AE/CB array of FIG. 5 according to the present invention; and

FIG. 7 is a flowchart of method steps for video game choreography based upon a user selected sound file according to one embodiment of the present invention.

FIG. 1 is a block diagram of an exemplary electronic entertainment system 100 according to the present invention. The entertainment system 100 includes a main memory 102, a central processing unit (CPU) 104, at least one vector processing unit 106, a graphics processing unit 108, an input/output processor 110, an I/O processor memory 112, a controller interface 114, a memory card 116, a Universal Serial Bus (USB) interface 118, and an IEEE 1394 Interface 120, although other bus standards and interfaces may be utilized. The entertainment system 100 further includes an operating system read-only memory (OS ROM) 122, a sound processing unit 124, an optical disc control unit 126 and a hard disc drive 128, which are connected via a bus 130 to the I/O processor 110. Preferably, the entertainment system 100 is an electronic gaming console. Alternatively, the entertainment system 100 may be implemented as a general-purpose computer, a set-top box, or a hand-held gaming device. Further, similar entertainment systems may contain more or less operating components.

The CPU 104, the vector unit 106, the graphics processing unit 108, and the I/O processor 110 communicate via a system bus 132. Further, the CPU 104 communicates with the main memory 102 via a dedicated bus 134, while the vector unit 106 and the graphics processing unit 108 may communicate through a dedicated bus 136. The CPU 104 executes programs stored in the OS ROM 122 and the main memory 102. The main memory 102 may contain prestored programs and programs transferred through the I/O processor 110 from a CD-ROM, DVD-ROM, or other optical disc (not shown) using the optical disc control unit 126. The I/O processor 110 primarily controls data exchanges between the various devices of the entertainment system 100 including the CPU 104, the vector unit 106, the graphics processing unit 108, and the controller interface 114.

The graphics processing unit 108 executes graphics instructions received from the CPU 104 and the vector unit 106 to produce images for display on a display device (not shown). For example, the vector unit 106 may transform objects from three-dimensional coordinates to two-dimensional coordinates, and sends the two-dimensional coordinates to the graphics processing unit 108. Furthermore, the sound processing unit 124 executes instructions to produce sound signals that are outputted to an audio device such as speakers (not shown).

A user of the entertainment system 100 provides instructions via the controller interface 114 to the CPU 104. For example, the user may instruct the CPU 104 to store certain game information on the memory card 116 or instruct a character in a game to perform some specified action. Other devices may be connected to the entertainment system 100 via the USB interface 118 and the IEEE 1394 interface 120. It should be noted that FIG. 1 illustrates only one configuration of the entertainment system 100; and alternate embodiments having more or less components coupled in a different configuration are contemplated.

FIG. 2 is a block diagram of an exemplary embodiment of the main memory 102 of FIG. 1 according to the present invention. The main memory 102 is shown containing a game module 200 which is loaded into the main memory 102 from an optical disc in the optical disc control unit 126 (FIG. 1). The game module 200 contains instructions executable by the CPU 104, the vector unit 106, and the sound processing unit 124 of FIG. 1 that allows a user of the entertainment system 100 (FIG. 1) to play a game. In the exemplary embodiment of FIG. 2, the game module 200 includes data storage 202, an

action generator 204, a characteristic generator 206, a data table adjuster 208, and a sound file database 212 containing one or more sound files (not shown).

In one embodiment, the action generator 204, the characteristic generator 206, and the data table adjuster 208 are software modules executable by the CPU 104. For example, the CPU 104 executes the action generator 204 to produce game play, including character motion and character response. In addition, the CPU 104 accesses data in data storage 202 as instructed by the action generator 204, the characteristic generator 206, and the data table adjuster 208. Furthermore, the CPU 104 executes the characteristic generator 206 to generate a character's expressions as displayed on a monitor (not shown), the CPU 104 executes the data table adjuster 208 to update data in data storage 202 during game play, and the CPU 104 processes a user selected sound file, for example, from the sound file database 212, to choreograph a video game sequence. The processing of the user selected sound file in connection with the data storage 202 is described further below in conjunction with FIGS. 3-7.

For the purposes of this exemplary embodiment, the game module 200 is a tribal simulation game in which a player creates and trains tribes of characters. However, the scope of the present invention covers any games in which characters simultaneously interact. Character interactions include, but are not necessarily limited to, individual and/or group fights, healing, retreats, and explorations, to name a few.

FIG. 3 is a block diagram of an exemplary embodiment of data storage 202 of FIG. 2. Data storage 202 includes an action event/camera behavior (AE/CB) database 308. Data storage 202 may include other databases 310 as required by the game module 200. For example, database 310 may include characteristics associated with game characters, such as physical and emotional attributes. The AE/CB database 308 is described further below in conjunction with FIGS. 5-6.

In one embodiment of the invention, a user initiates game play via instructions communicated to the CPU 104 (FIG. 1) via the controller interface 114 (FIG. 1) and the I/O processor 110 (FIG. 1). A user may select the sound file from the sound file database 212 (FIG. 2) upon initiation of game play. In operation, the sound processing unit 124 (FIG. 1) processes the selected sound file, and sends the processed sound file to speakers (not shown) and to the CPU 104. In one embodiment of the invention, the sound file is a directors track. In another embodiment of the invention, the sound processing unit 124 processes the sound file to generate a directors track. An exemplary embodiment of the directors track is discussed further below in conjunction with FIG. 4A.

The CPU 104 analyzes the directors track for musical events. For example, musical events may be qualitatively associated with emotions experienced by game users as the selected sound file is played via the speakers (not shown). Musical events, as related to user-experienced emotions, may be defined, but not limited to, an accelerando (a gradually faster tempo), an addolorato (a sorrowful passage), an allegro (a cheerful passage), an agitato (a lively passage, with excitement), a crescendo (gradually louder), a decrescendo (gradually softer), or a fermata (a pause), among many others. As discussed further below in conjunction with FIGS. 4A-4B, characteristic points in the directors track may be associated with a variety of musical events.

FIG. 4A illustrates an exemplary embodiment of a directors track 410, according to the present invention. For example, sound processing unit 124 (FIG. 1) processes a user-selected sound file, where the user-selected sound file is the directors track 410. In an alternate embodiment of the invention, the sound processing unit 124 processes the user-

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selected sound file to generate the directors track **410**. The directors track **410** may comprise a sequence of segments **412**, where each segment **412** includes one or more bytes (not shown) representative of the music data stream. Furthermore, each segment **412** includes a marker bit **415** that is either “on” (a “1” state, also referred to as a “1” bit) or “off” (a “0” state, also referred to as a “0” bit). The marker bit **415** may mark musical events associated with the sound file. According to the present invention, a marker bit value in a “1” state corresponds to a musical event. In an alternate embodiment of the invention, a marker bit in a “0” state may correspond to a musical event. In yet another embodiment of the invention, the marker bits **415** are embedded in the directors track **410** at regular intervals. For example, if the directors track **410** is five minutes in length, then the directors track **410** may be segmented into six hundred segments, where each segment is 0.5 seconds long.

The FIG. 4A exemplary embodiment of the directors track **410** shows four “on” marker bits (**415a**, **415b**, **415c**, **415d**) corresponding to four musical events of the sound file. For example, each of the four musical events may correspond to an emotional feeling specified by the game module **200** (FIG. 2). The emotional feelings may include, but are not limited to, feelings of fear, rage, happiness, sympathy, and hope. The scope of the present invention includes any music-generated emotions experienced by game users. For example, the four “on” marker bits (**415a**, **415b**, **415c**, and **415d**) may correspond to four musical events associated with four emotional feelings in a game user.

FIG. 4B is a graph of user emotion, corresponding to the FIG. 4A embodiment of the directors track **410**, where a quantification of user emotion may be based upon results of processing, manipulating, or transforming data (i.e., the bytes) of the directors track **410**. For example, the sound file may have a “accelerando” or a “crescendo” segment that is associated with an emotion of fear, or a “fermata” segment that is associated with an emotion of anxiety. Thus, in the FIG. 4A and FIG. 4B exemplary embodiments of the invention, the marker bit **415a** associated with a first musical event **420a** may correspond to user-felt “hope,” the marker bit **415b** associated with a second musical event **420b** may correspond to user-felt “fear,” the marker bit **415c** associated with a third musical event **420c** may correspond to user-felt “rage,” and the marker bit **415d** associated with a fourth musical event **420d** may correspond to user-felt “anxiety.” The marker bits **415** are set to an “on” state when different user-felt emotions are realized, as illustrated in the FIG. 4A and FIG. 4B exemplary embodiments of the invention. In another embodiment of the invention, the “on” marker bits **415** are located in the directors track **410** at regular set intervals, independent of the user-felt emotion at those set intervals.

In operation, the CPU **104** (FIG. 1) determines the state of the marker bits **415** in the directors track **410**. When the CPU **104** detects a marker bit value of “1,” such as the marker bit **415a**, then the CPU **104** accesses the AE/CB database **308** (FIG. 3) to select an action event and a camera behavior associated with the given detected marker bit. In addition, the CPU **104** determines a location in the game world of the selected action event (referred to as an action location).

In the previously described embodiments of the invention, the directors track **410** includes preprogrammed marker bits set to “on” and “off” states to define musical events. However, in an alternate embodiment of the invention, the directors track **410** includes preprogrammed marker bits which define musical events. In this embodiment of the invention, when the CPU **104** detects each marker bit in the directors track **410**, then the CPU **104** accesses the AE/CB database **308** to select

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an action event and a camera behavior associated with each detected marker bit. In another embodiment of the invention, the sound processing unit **124** (FIG. 1) or another module of the electronic entertainment system **100** processes a selected sound file, and embeds marker bits of given states into the directors track **410**, dependent upon predefined music-emotion criteria.

FIG. 5 is a block diagram of an exemplary embodiment of the AE/CB database **308** of FIG. 3. FIG. 5 includes associations between the marker bits **415** and AE/CB arrays **505**. For example, when the CPU **104** (FIG. 1) detects the marker bit **415a** (i.e., the first “on” marker bit of directors track **410** of FIG. 4A) that corresponds to the first musical event **420a** (FIG. 4B), the CPU **104** accesses AE/CB array **1505a**. When the CPU **104** detects the marker bit **415b** (i.e., the second “on” marker bit of directors track **410**) that corresponds to the second musical event **420b**, the CPU **104** accesses the AE/CB array **2505b**. As discussed further below in conjunction with FIG. 6, the CPU **104** then selects an action event pointer and a camera behavior pointer from the accessed AE/CB array **505**, and determines an action location. The action generator **204** (FIG. 2) then executes game instructions (located at the action event pointer) associated with the action event located at the action location in the game world, using camera behavior instructions located at the camera behavior pointer.

FIG. 6 is a block diagram of an exemplary embodiment of the AE/CB array **1505a** of FIG. 5. The AE/CB array **1505a** includes action elements **AE11 602a**, **AE12 602b**, and **AE13 602c**; four camera behavior (CB) pointers **CB11 pointer 604a**, **CB12 pointer 604b**, **CB13 pointer 604c**, and **CB14 pointer 604d**; and a default CB pointer **606**. Each action element **602** includes an action flag **608** and an AE pointer **610**. For example, the action element **AE11 602a** includes an action flag **11 608a** and an associated **AE11 pointer 610a**, action element **AE12 602b** includes an action flag **12 608b** and an associated **AE12 pointer 610b**, and action element **AE13 602c** includes an action flag **13 608c** and an associated **AE13 pointer 610c**. The state of the action flag **608** indicates if an action event corresponding to the AE pointer **610** is currently active in the game. For example, if the state of action flag **11 608a** is “1,” then the action event corresponding to the **AE11 pointer 610a** is currently active in game play. If the state of action flag **11 608a** is “0,” then the action event corresponding to the **AE11 pointer 610a** is currently not active in game play.

The action flags **608** are dynamic variables. The action generator **204** (FIG. 2) updates the action flags **608** at regular time intervals during game play. For example, a first action event corresponding to the **AE11 pointer 610a** may be a fight between tribe **1** and tribe **2**, a second action event corresponding to the **AE12 pointer 610b** may be a character **1** healing any other character, and a third action event corresponding to the **AE13 pointer 610c** may be a discovery of a significant game object or a special game character by tribe **3**. When the first action event corresponding to the **AE11 pointer 610a** is active during game play, the action generator **204** sets the flag **11 608a** to “1.” When the first action event corresponding to the **AE11 pointer 610a** is not active during game play, then the action generator **204** sets the flag **11 608a** to “0.”

The AE pointer **610** of each action element **602** points to an location corresponding to the given action. In one embodiment of the invention, if the state of the action flag **11 608a** is “1” and the state of the action flags **608b-608c** are “0,” then the CPU **104** selects the action flag **11 608a**, and the action generator **204** then executes game instructions located at the **AE11 pointer 610a**. In another embodiment of the invention, if more than one action flag **608** has a state of “1,” then the CPU **104** randomly selects one of the action flags **608** with the

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state of “1,” and the action generator **204** then executes game instructions located at the AE pointer **610** corresponding to the selected action flag **608**.

Once the CPU **104** has selected the action flag **608** and the corresponding AE pointer **610**, the CPU **104** then determines the game world action location of the action event associated with the selected AE pointer **610**. Subsequently, the CPU **104** determines a CB pointer **604** randomly. Each CB pointer **604** corresponds to a given camera behavior. Once the CPU **104** selects the CB pointer **604**, the camera behavior corresponding to the selected CB pointer **604** is executed by the action generator **204**. For example, when the CPU **104** selects the action flag **608a**, determines an action location corresponding to the action event associated with the AE pointer **610a**, and selects the CB pointer **604b**, then a user views the action event located at a game world location specified by the action location and associated with the AE pointer **610a**, using a camera behavior associated with the CB pointer **604b**.

The scope of the present invention includes any camera behavior. According to the present invention, camera behavior includes camera filters to generate color, black & white, and graininess effects; camera movements such as camera tilt, orbit, character and/or group tracking (e.g., group tracking of wounded characters); and camera special effects such as camera zoom, wide-angle, pan, blur, slow motion, and stop-time. The scope of the present invention includes other types of camera behaviors as well, such as a camera view from a perspective of a given character directed at another given character.

For example, the CB **11** pointer **604a** may be associated with a camera positioned horizontally that orbits a point in a 360 degree ring located at ground level. The CB **12** pointer **604b** may be associated with stop-time as the camera circles the point in a 360 degree ring located at ground level. The CB **13** pointer **604c** may be associated with a camera that circles the point in a ring elevated above the ground and centered about a point. Finally, the camera behavior associated with the CB **14** pointer **604d** may be similar to the camera behavior associated with the CB **13** pointer **604c**, but the rotation speed may have a different value. Since for each action event selected by the CPU **104**, the CPU **104** randomly chooses a camera behavior, it is unlikely that a given musical event will result in a display of the same action event with the same camera behavior each time the musical event occurs.

In another embodiment of the invention, if no action flags **608** are “on” for a given musical event **420**, then the CPU **104** chooses the default CB pointer **606** to view the current action event. In another embodiment of the invention, the default CB pointer **606** is not enabled, and if no action flags **608** are “on” for a given musical event **420**, then the CPU **104** randomly chooses a CB pointer, for example, the CB pointer **604c**, to view the current action event.

FIG. **7** is a flowchart of method steps for video game choreography based upon a user selected sound file according to one embodiment of the invention. In step **705**, a video game user selects a sound file upon video game initialization. In step **710**, the sound processing unit **124** (FIG. **1**) of the electronic entertainment system **100** (FIG. **1**) processes the sound file. In a preferred embodiment of the invention, the sound file is the directors track **410** (FIG. **4A**). The sound processing unit **124** sends the directors track **410** to the CPU **104**. Subsequently, the CPU **104** processes the directors track **410** and detects a first marker bit of the directors track **410** in step **715**. In step **720**, the CPU **104** determines the state of the detected marker bit. If the CPU **104** discovers that the detected marker bit is in an “off” state, then in step **725**, the CPU **104** computes

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whether all the marker bits of the directors track **410** have been detected. If all the marker bits have been detected, then the method is completed. If, in step **725**, the CPU **104** determines that all the marker bits have not been detected, then in step **730**, the CPU **104** detects the next marker bit. The method then continues at step **720**.

If, in step **720**, the CPU **104** ascertains that the detected marker bit is in an “on” state, then in a step **735**, the CPU **104** accesses the AE/CB array **505** associated with the detected marker bit. The CPU **104** then computes the number of action flags in the AE/CB array **505** (FIG. **5**) that are “on” in step **740**. Separately, in step **745**, if the CPU **104** determines that the number of “on” action flags are zero, then in step **750**, the CPU **104** selects the default CB pointer **606** (FIG. **6**). The action generator **204** (FIG. **2**) executes the camera behavior located by the default CB pointer **606** in step **755**, and the method then continues at step **725**.

Referring back to step **745**, if the CPU **104** ascertains that the number of “on” action flags is not equal to zero, then in step **760**, the CPU **104** determines if the number of “on” action flags is greater than one. If the number of “on” action flags is greater than one, then in step **765**, the CPU **104** randomly selects an action flag **608** (FIG. **6**) from the plurality of “on” action flags **608**. Each action flag **608** is associated with an action event pointer **610** (FIG. **6**). In addition, the CPU **104** determines an action location associated with the action event pointer **610**. Next, in step **770**, the CPU **104** randomly selects a CB pointer **604** (FIG. **6**) from the CB pointers **604** stored in the AE/CB data array **505** associated with the detected marker bit. In step **775**, the action generator **204** executes game instructions located by the action event pointer **610** associated with the selected action flag **608** using camera behavior instructions located by the selected CB pointer **604**. The method then continues at step **725**.

Referring back to step **760**, if the CPU **104** discovers that the number of “on” action flags is not greater than one, then in step **780**, the CPU **104** selects the “on” action flag. The method then continues at step **770**. It should be noted that FIG. **7** illustrates one exemplary embodiment of a method according to the present invention. Alternatively, the method may be practiced with more or less steps and in a different order.

The invention has been described above with reference to specific embodiments. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention. For example, the present invention may be used in video generation other than in a gaming environment. The foregoing description and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. A sound track stored in a non-transitory tangible medium, the sound track comprising:
 - a plurality of time-defined segments, wherein each time-defined segment of the plurality of time-defined segments includes:
 - one or more bytes representative of a music data stream, and
 - at least one marker bit, wherein each marker bit is associated with a “1” state or a “0” state; and
 - one or more characteristic points associated with one or more musical events, wherein each of the one or more musical events is associated with an emotion experienced by a game user, and wherein each of the one or more musical events corresponds to a marker bit in a “1” state.

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2. The sound track of claim 1, wherein each marker bit is “on” if it is associated with a “1” state and “off” if it is associated with a “0” state.

3. The sound track of claim 1, wherein each of the one or more musical events corresponds to a marker bit in a “0” state.

4. The sound track of claim 1, wherein the at least one marker bit of each time-defined segment collectively form a plurality of marker bits across the plurality of time-defined segments, and wherein the plurality of marker bits are embedded in the sound track at regular intervals.

5. The sound track of claim 1, wherein each marker bit is preprogrammed to be associated with either an “on” or “off” state to define a musical event.

6. The sound track of claim 1, wherein each marker bit is embedded into the sound track based on predefined music-emotion criteria.

7. The sound track of claim 1, wherein each marker bit is associated with an action event and a camera behavior.

8. The sound track of claim 7, wherein the action event is associated with an action location, wherein the action location is a determined location of the action event in a game world.

9. The sound track of claim 8, wherein the camera behavior may be used to view the action location.

10. The sound track of claim 7, wherein the action event is a character interaction in a game world.

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11. The sound track of claim 10, wherein the character interaction is an individual or group fight, healing, retreat, or exploration.

12. The sound track of claim 7, wherein the action event is a discovery of a game object in a game world.

13. The sound track of claim 7, wherein the camera behavior is a camera movement.

14. The sound track of claim 13, wherein the camera movement is a tilt, orbit, or tracking of a group or character.

15. The sound track of claim 7, wherein the camera behavior is an application of a camera special effect.

16. The sound track of claim 15, wherein the camera special effect is a zoom, wide-angle view, pan, blur, slow-motion view, or a stop-time view.

17. The sound track of claim 15, wherein the camera special effect is a camera view from a perspective of a first character directed at a second character.

18. The sound track of claim 1, wherein each of the one or more musical events is an emotionally critical musical event.

19. The sound track of claim 1, wherein the each of the one or more musical events corresponds to an accelerando, addolorato, allegro, agitato, decrescendo, or fermata.

20. The sound track of claim 1, wherein the emotion experienced by a game user corresponds to a feeling of fear, rage, happiness, sympathy, or hope.

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